

Method

A bubble column device (Figure 2) was developed for quantifying colloidal surface excesses. Air is bubbled through the vertical column containing dilute aqueous suspension of the colloids. The rising bubbles sorb and carry the surface-active species upwards, then release them back to the solution at the free surface where the bubbles burst. The steady-state concentration profile reflects the balance between upward transport by partitioning onto rising bubbles and downward transport by eddy dispersion (Eq. 2),

$$a\Gamma = AD\frac{dC}{dz} \quad (2)$$

where a is the average surface area per bubble, f is the bubble generation rate, Γ is the surface excess, A is the column cross-sectional area, D is the column eddy dispersion coefficient, C is the concentration in solution (suspension), and z is the vertical coordinate.

In dilute solutions, partitioning at the water-gas interface is given by

$$\Gamma = KC \quad (3)$$

For surface-active molecules, K is the linear adsorption isotherm coefficient. In extending this approach to colloid systems, we define K as the colloid partition coefficient. It is expected that in many natural systems the suspended colloid concentration will be sufficiently dilute such that the linear K approximation is sufficient.

The steady-state ratio of the concentration at elevation z versus at the bottom of the column is an exponential profile.

$$\frac{C(z)}{C_b} = \exp\left(\frac{afKz}{AD}\right) \quad (4)$$

By predetermining D , af , and measuring the steady-state concentration profile $C[z]$, the partition coefficient K can be determined.

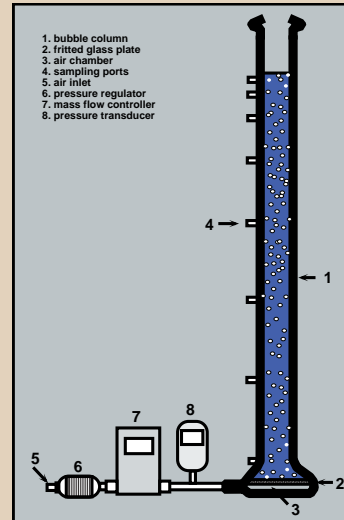


Fig. 2. Bubble Column Device